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The impacts of a CAP budget reform on the world economy: a CGE assessment

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Abstract

This paper attempts to capture the implications for the European Union (EU) and third countries of resource reallocations in the Common Agricultural Policy (CAP) budget provision for the period 2014-2020. It employs a sophisticated dynamic variant of the GTAP model, known as the Modular Applied General Equilibrium Tool (MAGNET) model. Given the focus on agri-food markets, a number of additional modelling features are incorporated to capture the peculiarities of agricultural factor markets (e.g. endogenous land supply, heterogeneous land usage; agricultural/non-agricultural factor split) and agricultural policy (e.g. decoupled payments, rural development support).

Of particular importance to this study is the comparatively detailed treatment of the CAP budget, with coverage of first and second pillar, where the latter explicitly characterises between five distinct rural development measures (i.e. physical investment, human capacity, agri-environmental, less favoured areas, and wider rural development). Finally, the 'own resources' component of the European budget is also modelled, with associated rebate mechanisms, in order to consider the political economy of European budgetary reform.

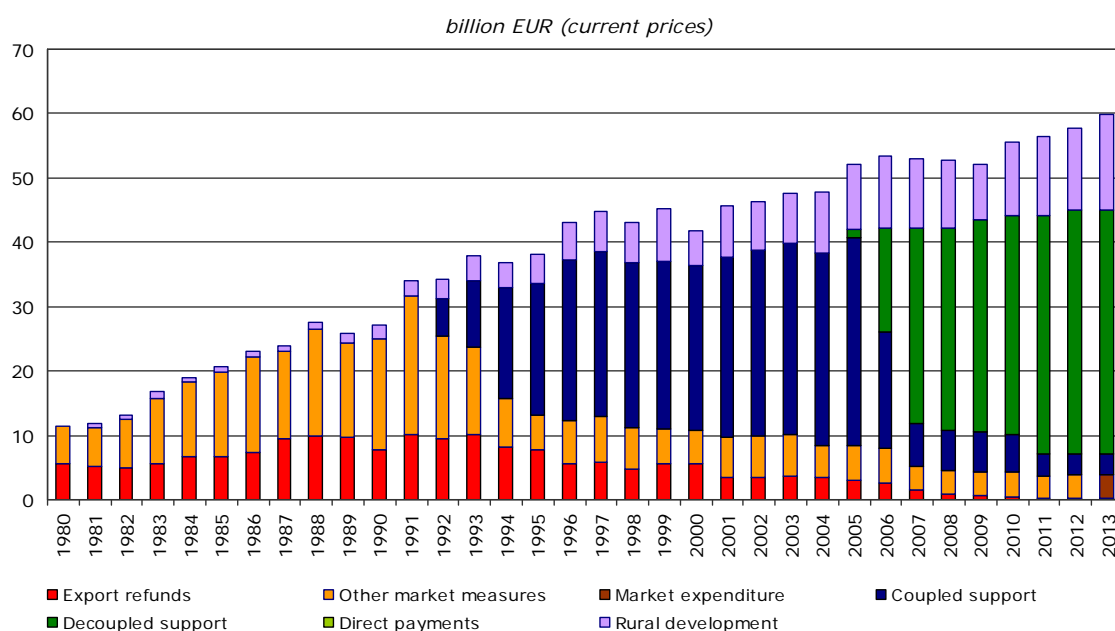
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1. Introduction

European agricultural market support and direct payments amount to 44 billion euros in 2012 – of which farm subsidies represent 40 billion euros. Rural development measures add 13 billion euros to the European Union (EU) budget devoted to the Common Agricultural Policy (CAP). As a total, roughly 40 per cent of the EU budget aims at funding this sector-based policy. Whereas a CAP reform is expected for the period post-2013, an agreement on the 2014-2020 EU financial framework shall be reached before then.

In spite of incremental reforms illustrated in Figure 1, CAP expenditures remain a major item of the European budget. If the share of CAP spending within the European expenditures fell down in last decades, the absolute value has been continually increasing. Mechanically, the share of market support and direct payments in European total spending dropped down from 70 per cent in 1973 to 56 in 1984, 46 in 1992 and one third nowadays. Budgetary return is key when dealing with CAP reform. Nevertheless a purely quantitative calculation of net balance by Member is questionable. Indeed a purely financial approach does not take into account the non-pecuniary advantages provided by European policies and integration.

Figure 1. CAP budget breakdown by type of measures, billion euros, 1980-2013



Source: European Commission

This paper attempts to capture the implications for the EU and third countries of resource reallocations under various scenarios of changes in CAP budget provision for the period 2014-2020. These scenarios aim to focus on the economic gains/costs resulting from reducing first pillar of the CAP instruments (market measures and direct payments) while strengthening support towards rural development measures (second pillar of the CAP).

More specifically, the study sets out to examine the implications on agricultural and food trade both within the EU and on third countries. Effects on developing countries are emphasized, as well as for key trade partners which are negotiating (or plan to negotiate) trade agreements with the EU (namely Mercosur, USA, and Japan). In this way, we are attempting to capture those trade distortions arising from the CAP budget in its current form. Our study enhances the existing vast literature about such effects by employing both innovative CGE methodology and policy scenarios.

The second and third sections of this paper present the model and data used for the analysis. Then, the baseline that covers the period 2007-2020 is explained in the fourth section, as well as the scenario performed. Results are presented in the fifth section. The last section provides some concluding remarks.

2. Model description

The model used in this analyse is Modular Agricultural GeNeral Equilibrium Tool (MAGNET)¹, a recursive dynamic CGE model.

MAGNET is a global (worldwide) economic simulation model that consists of a set of single-country CGE models linked by their trading relationship. This model is based on the GTAP² model (Hertel, 1997), a widely used tool for global trade analysis. The behavioural relationships used in MAGNET are standard GTAP: firms maximize profits using technology characterized by Constant Elasticity of Substitution (CES) production functions over primary inputs and Leontief production functions across intermediate inputs. This implies constant returns to scale technology in production. The elasticities of substitution are commodity-specific. Domestic demand is satisfied by composite commodities that are constructed in two

¹ MAGNET is part of the integrated Modelling Platform for Agro-economic Commodity and Policy Analysis (iMAP) hosted by the European Commission's Joint Research Centre, Institute for Prospective Technological Studies (M'barek et al., 2012).

stages. In the first stage, consumers decide on the quantity of each commodity in their consumption basket by maximizing a modified Stone-Geary utility function (where all subsistence shares are equal to zero). In the second stage, consumers minimize the cost of their commodity bundle by deciding on the shares of domestic and imported varieties that comprise each commodity. This decision is governed by an Armington import aggregation function. All commodity and activity taxes are expressed as *ad valorem* tax rates, while income taxes depend on household income.

The price systems are linearly homogenous and thus only changes in relative prices matter. Consequently, the model has a global numeraire (world price index of primary factors), which is a benchmark of value against which changes in all other prices can be measured. All tax rates, including import tariffs, are modelled as *ad valorem* rates. This means that specific tariffs have to be converted to their *ad valorem* equivalent. Prices and quantities of all non-endowment commodities and regional incomes are endogenous variables.

In general, closure rules adopted in this version of MAGNET follow the modified standard neo-classical assumptions, namely:

1. Savings are fixed and the investment variable is savings-driven so that investment is forced to adjust in line with regional changes in savings.
2. The current account surplus is fixed on a regional basis, so that each region's share in the global pool of net savings is fixed.
3. Stocks of factors of production, skilled labour, capital and land, are exogenously given in the base year while unskilled labour is endogenously determined to allow for unemployment.
 - 3.1. Capital is updated at the end of each period with the investment taking place within the period minus the depreciation of the existing stock, following the usual recursive dynamic approach.

² Global Trade Analysis Project, see <https://www.gtap.agecon.purdue.edu/>

- 3.2. The stock of skilled labour grows in the baseline and simulation period following the population growth rate.
- 3.3. Skilled labour and capital are fully mobile between sectors in the same region and fully employed in all regions (wages for skilled labour and return of capital are endogenously determined, i.e. they are allowed to vary to assure that the sum of demands from all activities equals the quantity supplied).
- 3.4. Unskilled labour is not fully employed but is assumed to be fully mobile between sectors in the same region. For the unskilled labour real wages are exogenously fixed while the supply of unskilled labour is endogenous and adjusts so as to equate labour demand. In the EU and OECD wages for unskilled labour are fixed at their initial level while for the other regions they grow at the GDP growth rate. Both types of labour are immobile between countries (immigration is not modelled).
- 3.5. Land is fully employed, but its ability to freely move between sectors (imperfect mobile factors are usually called sluggish in GTAP-based models) is limited by the introduction of a CET function, which transforms one use of the endowment into another. Contrary to labour and capital, sluggish endowment commodities can exhibit differential equilibrium rental rates across uses. Land is by definition immobile between regions.

4. Technical change is exogenous to the model.

An innovative feature of MAGNET is its modular structure. MAGNET was extended in different directions with the use of various sub-modules, which can be switched on and off. This allows tailoring of the model structure to the research question at hand. For example, MAGNET has a module that can be applied to analyse land use which includes a sophisticated land supply function, and it also has a biofuel module which allows for a detailed analysis of this sector with the inclusion of by-products.

Of particular interest, for this paper, is the CAP module which allows the inclusion of a CAP budget. It is worth mentioning that we focus on agricultural and rural development expenditures but also on the contribution side of the CAP budget. However effects of transferring financial resources between EU-28 and related budgetary trade-offs are not taken into account.

Existing code is modified to incorporate the own resources system (including the UK rebate, and subsequent rebates on the rebate). The net contribution of the EU27 CAP budget, by definition, sums to zero (i.e. we assume that it is a self financed budget within the larger EU budget) and a relevant CAP (first and second pillars) budget share (endogenous) is employed to estimate the necessary own resources to finance first and second pillar spending.

Decoupling of factor subsidies is handled in such a way that first pillar subsidies are linked to land as modelled in Philippidis (2010). The same approach is adopted for agri-environmental payments of the second pillar, as they are considered subsidies to land (similar assumptions were set in the Scenar 2020 II study using LEITAP (Nowicki et al., 2009)). The other four second pillar measures are assumed to increase the overall productivity (output augmenting technological change) and the input productivity (intermediate input augmenting technological change). The increase depends *inter alia* on four coefficients which are determined exogenously (the latter are borrowed from Nowicki et al., 2009) and capture the technology effects of the types of second pillar subsidies which have already been defined.

3. Database

The data used in this study are based on the most recent GTAP database version 8 (Aguiar, McDougall and Narayanan, 2012) released in March 2012 and contains data for 2007.³ This database contains complete bilateral trade information, transport and protection linkages. It includes 57 commodities and 129 regions, aggregated for the purpose of this study to 21 commodities of which 18 are part of the agricultural and food sectors and 25 countries or regions (see Appendix, Tables A1 and A2).

European countries which benefits from budget rebate have been specified separately, i.e. the United-Kingdom (UK), Germany, Netherlands, Austria, Sweden, and Denmark. France, Spain, Italy are also treated separately in order to identify the largest budget recipients of the CAP (5 counties captures 70% of CAP budget, Germany and the UK wrap up this ranking). Poland and Romania represent New Member States (NMS) resulting from EU enlargement in

³ The GTAP database v8 documentation is not yet fully available at the date of writing this paper. Documentation of GTAP database v7 is available in Narayanan and Walmsley (2008).

2004 and 2007, respectively. The rest of EU countries are gathered either in *Other EU15* or *Other EU12* (see Appendix, Table A3). Lastly, as the 28th EU Member State from July 1st, 2013, Croatia is treated separately.

Outside the EU, China, Japan, India, USA, and Canada are specified separately. Then groups of countries include European Free Trade Agreement (EFTA), Eastern Partnership (EAST), Everything But Arms (EBA) countries, Middle East and North Africa (MENA), Other Sub-Saharan Africa (SSA), MERCOSUR, Australia and New Zealand (ANZ), and Rest of the World (ROW).

In order to construct a baseline, projections of GDP, population and other key indicators are used and obtained from various sources. First, data on GDP and population are sourced from the USDA-ERS projections.⁴ Projections by the World Development Indicators (WDI) are the main source of data for labour force. Data for capital stock projections are taken from the OECD.⁵ Inflation historical series and estimates are taken from IMF.⁶

Key data aspect of this work relies in the representation of CAP spending. Data used in the CAP module come on the one hand from the European Agricultural Guarantee Fund (EAGF) for first pillar measures, and on the other hand from the European Agricultural Fund for Rural Development (EAFRD) for second pillar measures. For second pillar measures, both European and national contributions are taken into account.

Spending from first pillar include (i) Single Farm Payments (SFPs) i.e. decoupled payments, (ii) specific support granted under article 68, (iii) coupled direct payments, (iv) market measures, and (iv) other spending such as food safety or animal welfare.

Spending from second pillar include those measures targeting (i) investment in agriculture, (ii) investment in human capacity, (iii) investment in technology, (iv) support to Less Favoured Areas (LFAs), and (v) agri-environmental measures.

⁴<http://www.ers.usda.gov/Data/Macroeconomics/#BaselineMacroTables>

⁵http://www.oecd.org/home/0,2987,en_2649_201185_1_1_1_1_1,00.html

⁶<http://www.imf.org/external/data.htm>

Data for Croatia come from the IPARD Programme 2007-2013 and financial package for the accession negotiations (European Commission, 2009). GTAP database v.8 does not include domestic support for Croatian agriculture in 2007. We thus include data from Croatia's Ministry of Agriculture, Fisheries and Rural Development for the year 2007.

4. Baseline and scenarios

As a starting point, our baseline scenario includes background shocks to characterise macro projections over time periods and envisaged trade policy developments. Additionally, we capture the evolution of the CAP up to 2020 including the phasing in of direct payments to recent accession members as presented in Table 1 (Croatia included), increased rate of modulation from 5% to 10%, quota reforms, further decoupling and current projections for the CAP budget in the financial framework 2014-2020.⁷ It is worth mentioning that special attention is given in modeling 2008 CAP health check outcomes (see Appendix, Table A4).

Table 1. Direct payment phasing-in schedule in NMS

Year	EU-10	Bulgaria and Romania	Croatia
2007	40 %	25 %	
2008	50 %	30 %	
2009	60 %	35 %	
2010	70 %	40 %	
2011	80 %	50 %	
2012	90 %	60 %	
2013	100 %	70 %	25 %
2014		80 %	30 %
2015		90 %	35 %
2016		100 %	40 %
2017			50 %
2018			60 %
2019			70 %
2020			80 %
2021			90 %
2022			100 %

Direct payments are introduced in accordance with the schedule of increments expressed as a percentage of the corresponding level of the direct payments at the end of the period, i.e. 2013, 2016, and 2022 for EU-10, Bulgaria and Romania, and Croatia respectively.

Source: European legislation

⁷ European Commission, COM(2011) 628 final/2.

We do not take into account eventual complementary national direct payments in NMS. Indeed NMS are allowed to top up within a limit first pillar direct payments during the phasing in period. However such data are not available in a comprehensive approach.

It is assumed that allocation across rural development measures for the period 2007-2013 will remain unchanged for the period 2014-2020, from both European and national budgets (by contrast to first pillar measures which are fully covered by European funds).

As regards trade policy, we assume reciprocal free trade agreements between the EU and respectively MENA, Eastern Partnership and Sub-Saharan Africa. At multilateral level, the Doha Round is not concluded in 2020 as well as current and expected free trade negotiation between the EU and respectively the US, Canada, MERCOSUR and Japan. However we assume export refunds are unilaterally eliminated by the EU in 2020.

As regards the European budget, 2014-2020 resources and spending structures remain as in 2007-2013. The UK rebate and consecutive budget rebates keep going. European Council agreement reached in February 2013 about mechanisms of further financial returns is implemented, and Croatia is included in this scheme.

In comparison with this baseline, three scenarios are explored with respect to the total allocation and distribution of resources to the CAP budget: In the first scenario, a low budget cut of €23.3 billion (with cuts of €15 billion and €8.3 billion in first and second pillars, respectively) is cumulatively implemented over the period 2014-2020 based on a the European Council President proposal (Ref. Agrafacts 84-12). In the second scenario, a high budget cut of €200 billion is cumulatively implemented (i.e., €200 billion in first pillar, second pillar fixed) over the period 2014-2020, as proposed by the UK (Ref. Agrafacts 73-12). The third scenario represents a stylised scenario where there are no further budget cuts, instead there is a redistribution of funds of €60 billion from first to second pillar – to the extent that second pillar become fully funded by the European budget. This amount corresponds to the expected national contribution of second pillar.

5. Results

6. Concluding remarks

7. References

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8. Appendixes

Table A1: Sector aggregation

No	Code	Description of product category	HS code
1	Agriculture	Wheat	1001 Wheat and meslin
2		Other cereals	1002 rye in the grain 1003 barley 1004 oats 1005 corn (maize) 1006 rice 1007 grain sorghum 1008 buckwheat, millet & canary seed, cereals nesoi
3		Vegetables, fruit & nuts	07 edible vegetables 08 ed. fruits & nuts, peel of citrus/melons
4		Oilseeds	1201 Soybeans, whether or not broken 1202 peanuts (ground-nuts), raw 1203 copra 1204 flaxseed (linseed), whether or not broken 1205 rape or colza seeds, whether or not broken 1206 sunflower seeds, whether or not broken 1207 oil seeds & oleaginous fruits nesoi, broken or not 1208 flour & meal of oil seed & olea fruit (no mustard)
5		Sugar cane & sugar beet	121291 Sugar Beet 121292 Sugar Cane
6		Plant-based fibres and other crops	13 lac, natural gums, resins, etc. 14 vegetable plaiting materials 0199 Other raw vegetable materials 06 Live trees, other plants, cut flowers 1209 seeds, fruit and spores, for sowing 1210 hop cones, fresh or dried, lupulin 1211 plants etc for pharmacy, perfume, insecticides etc 121210 Locust Beans (Including Locust Bean Seeds) 121220 Seaweeds and Other Algae 121230 Apricot, Peach or Plum Stones and Kernels 121299 Other Vegetable Prods (chicory roots etc) 1213 Cereal straw & husks unprep w/n chop etc or pellet 1214 rutabagas, hay, clover & other forage products
7		Live cattle, sheep, goats, horses	0101 horses, asses, mules and hinnies, live 0102 bovine animals, live 0104 sheep and goats, live
8		Live pigs, poultry, other unprocessed or preserved animal products	0103 swine, live 0105 chickens, ducks, geese, turkeys, and guineas, live 0106 animals, live, nesoi - not elsewhere specified of indicated. 0407 birds' eggs, in the shell, fresh, preserved or cooked 0408 birds' eggs, not in shell & yolks, fresh, dry, etc 0409 honey, natural 0410 edible products of animal origin, nesoi 05 products of animal origin
9		Raw milk	0401 milk and cream, not concentrated or sweetened
10		Wool, silk cocoons	0296 raw animal materials used in textiles 50 silk, inc. yarns & woven fabrics thereof 51 wool & fine or coarse animal hair, inc. yarns & woven fabrics thereof
11		Meat cattle, sheep, goat, horse	0201 meat of bovine animals, fresh or chilled 0202 meat of bovine animals, frozen 0204 meat of sheep or goats, fresh, chilled or frozen 0205 meat of horses, asses, mules, hinnies fr. chld. fz 0206 edible offal, bovine, swine, sheep, goat, horse, etc.

12	Food	Meat pork. poultry. other	0203 meat of swine (pork). fresh. chilled or frozen 0207 meat & ed offal of poultry. fresh. chill or frozen 0208 meat & edible offal nesoi. fresh. chilled or frozen 0209 pig & poultry fat fresh chld frzn salted dried smkd 0210 meat & ed offal salted. dried etc. & flour & meal
14		Vegetable oils and fats	15 animal or vegetable fats. oils & waxes
15		Dairy products	0402 milk and cream. concentrated or sweetened 0403 buttermilk. yogurt. kephir etc. flavored etc or not 0404 whey & milk products nesoi. flavored etc. or not 0405 butter and other fats and oils derived from milk 0406 cheese and curd
16		Sugar	17 sugar (raw. refined. confectionery)
17		Milled rice and other food products	09 coffee. tea. mate & spices 11 milling industry products 16 ed. prep. of meat. fish. crustaceans. etc 18 cocoa & cocoa preparations 19 preps. of cereals. flour. starch or milk 20 preps of vegs. fruits. nuts. etc. 21 misc. edible preparations Processed rice
18		Beverages and tobacco	22 beverages. spirits & vinegar 23 residues from food industries. animal feed 24 tobacco & manuf. Tobacco substitutes
19		Extraction: forestry, fishing, coal, oil, gas, other mining	
20		Manufactures (primary and machinery)	
21		Services	

Table A2: Region aggregation

No.	Code	Countries

Table A3: European aggregation

No.	Code	Countries
1	EU28	Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, United Kingdom, Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovak Republic, Slovenia, Bulgaria, Romania, Croatia
2	EU27	Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, United Kingdom, Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovak Republic, Slovenia, Bulgaria, Romania
3	EU15	Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, United Kingdom,
4	EU12	Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovak Republic, Slovenia, Bulgaria, Romania

Table A4: 2008 CAP Health check main issues and outcomes

Set-aside	<ul style="list-style-type: none"> Abolish the requirement to leave 10 per cent of arable lands fallow
Milk quotas	<ul style="list-style-type: none"> Increase quotas by 1 per cent annually from 2009 to 2013 (milk quotas will be phased out by April 2015)
Decoupling	<ul style="list-style-type: none"> Arable crops, olives and hops to be fully decoupled from 2010 Seeds, beef and veal payments (except the suckler cow premium) to be decoupled by 2012
SFP model	<ul style="list-style-type: none"> Additional flexibility granted to Member States distributing decoupled support under the historic model with funds to be distributed on a regional basis
SAPS	<ul style="list-style-type: none"> Extend the SAPS to 2013 (initially SAPS needed to be converted to the SFP model by 2010-2011)
Cross compliance	<ul style="list-style-type: none"> Simplify the requirements by withdrawing some irrelevant and redundant rules Implement new requirements on landscape features and water management
Article 68	<ul style="list-style-type: none"> Member States may use up to 10 per cent of their financial ceiling to grant measures to address disadvantages for farmers in certain regions specialising in dairy, beef, goat and sheep meat, and rice farming Risk management measures broadened to include crop, animal and plant insurance and mutual funds for animal diseases and environmental incidents
Modulation	<ul style="list-style-type: none"> Overall increase in modulation by 5 per cent distributed over four steps beginning in 2009, to reach 10 per cent by 2012 Progressive modulation of 4 per cent for direct payments above 300,000 euros
Intervention mechanisms	<ul style="list-style-type: none"> Abolish intervention for pigmeat Set at zero the intervention quantity for barley and sorghum Introduce tendering for common wheat, butter and skim milk powder once threshold has been reached
Payment limitations	<ul style="list-style-type: none"> Apply either a minimum payment (100 euros) or a minimum size of eligible area per holding (1 hectare) with the exception of Portugal, Hungary and Slovenia for which the minimum size remains 0.3 hectares
Specific scheme	<ul style="list-style-type: none"> Protein crops, rice and nuts will be decoupled by 1 January 2012 Abolish the energy crop premium in 2010
Rural development	<ul style="list-style-type: none"> Reinforce programmes in the fields of climate change, renewable energy, water management, biodiversity, dairy restructuring (funded with additional modulation)

Source: European Commission